Examining the interconnection of job satisfaction and organizational commitment: An application of the bivariate probit model

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Abstract

Links between employee commitment to their organizations and satisfaction with their jobs have been the subject of a large amount of empirical research, and still there seems little agreement about the causal connections between these two important employee attitudes. Understanding these attitudes is important because they have an important effect on organizational performance, and these attitudes can be influenced by human resource policies and practices. This paper assesses the gains from the use of a bivariate probit approach in measuring the connections between job satisfaction and organizational commitment. This paper is the first to make use of the bivariate probit approach in this context, and it improves our understanding of the connections between HR policy and these important employee attitudes. Our approach allows a direct test of the hypothesis that job satisfaction and organizational commitment are jointly determined by demographic and policy factors. The results are compared with the results from the more traditional binomial probit approach to illustrate the degree of bias corrected by the bivariate approach.

Keywords: Organizational commitment, job satisfaction, work attitudes, human resource management, bivariate probit

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The connections between job satisfaction and organizational commitment have been the subject of a great deal of attention in recent years. This effort has enhanced our understanding of the determinants of these two important employee attitudes, but some important inconsistencies remain despite the cumulative results of this effort. Some authors find that job satisfaction generates commitment. Others find the reverse. Some authors find both and others find neither. In order to further our understanding of this (clearly complex) relationship, this paper explores the hypothesis that the observed relationship between commitment and satisfaction is the result of a joint selection of commitment and satisfaction levels by employees.

Job satisfaction is one of the most heavily researched employee attitudes over the last 50 years. Researchers have measured job satisfaction as a 'global' measure, as well as by focusing on several constituents, or facets, of job satisfaction (Price, 1997). This study adopts a definition of job satisfaction that focuses on employee satisfaction with career opportunities, the levels of achievement and satisfaction with the levels of influence they have over their jobs. This approach focuses on intrinsic elements of job satisfaction to generate an overall measure of job satisfaction.[1]

Organizational commitment is defined for the purposes of this paper as the degree to which an employee feels a sense of loyalty to the organization. The approach taken here captures a form of affective commitment to the entire organization rather than commitment to a particular team or unit within that organization. This approach is consistent with measures used in Mueller, Wallace and Price (1992), Price (1997) and Currivan (1999).

[1] Links between job satisfaction and pay satisfaction are discussed in the description of the data, below.

Consistent with the approach taken in Currivan (1999), this paper looks for evidence of the causal links between a range of work characteristics, job satisfaction and organizational commitment. These relationships examined in this paper are summarized in Figure 1.

<<Figure 1 about here>>

Hypothesis 1 (H1) is that a range of work characteristics influence job satisfaction. Indeed, H1 captures an entire family of hypotheses. For example, that job autonomy influences job satisfaction, that peer support influences job satisfaction, etc. Hypothesis 2 (H2) refers to another family of hypotheses, namely that a range of work characteristics influence organizational commitment.

The main contribution of this paper is to examine H1 and H2 at the same time, while allowing for the possibility that employee attitudes towards the job and towards the organization are jointly determined. Careful application of modern analytical tools may help us distinguish between competing theories about the relationships between commitment and satisfaction.

Readers unfamiliar with the literature on commitment and satisfaction could be forgiven for wondering why the determinants of commitment and satisfaction are of such interest. The attention on these attitudes arises because there is mounting evidence that changes in these employee attitudes generate significant changes in behavior that can change the profits of companies. Though not the specific subject of this paper, the interested reader is referred to work by Appelbaum, et al (2000), Arthur (1994), Batt and Valcour (2003), Becker and Huselid (1999), Guest (1997), Huselid (1995) and Purcell, et al (2003). Each of these works identifies important linkages between human resource policies and/or practices and organizational performance. There is considerable variety in the measurement strategies used in these pieces of work, but the collective picture is one consistent with a meaningful link between the human resource policies chosen, and the way that they are implemented with

measures like employee turnover, customer service levels, labor productivity, and financial performance.

The diversity of the results reported in the literature indicates that the links between organizational commitment and job satisfaction are complex, and that these attitudes are still misunderstood. This paper attempts to improve our understanding in this area by using a bivariate probit approach to analyze data from a new database. This statistical approach allows simultaneous estimation of the effects of hypothesized variables on commitment and satisfaction. The results indicate that there is a significant relationship between job satisfaction and organizational commitment, even after controlling for many individual-specific and job-specific factors that are thought to affect commitment and satisfaction. This result is consistent with the hypothesis that commitment and satisfaction are determined jointly, and thus provides a potential explanation for the apparent incongruity between various published results.

This paper begins with a review of the varied literature on the links between organizational commitment and job satisfaction. The paper then describes the bivariate probit model, and explains why this approach has the potential to resolve some of the unanswered questions from this literature. Section 3 describes the data used to examine these questions, and Section 4 presents the results. A discussion of these results follows, and the paper concludes with some suggestions for further work.

1 Literature review

Some authors find that job satisfaction causes commitment. Studies like those published by Lincoln and Kalleberg (1985, 1990), Mowday et al (1982), Gaertner (1999) and Wallace (1995) are examples of the work supporting this perspective. For example, Lincoln and Kalleberg (1990) find a stronger connection between lagged satisfaction and commitment than they find between lagged commitment and satisfaction. From this, they infer the

direction of causation. The evidence presented in this group of studies is consistent with the ideas at the center of the job design literature. Of particular note is the idea that creating satisfying jobs for employees will enhance their commitment to the organization, thus reducing employee turnover and its associated costs. Increased commitment might also improve customer satisfaction, and generate repeat purchase behavior.[2]

This perspective is only one in the literature. There is also published evidence indicating that high levels of commitment to the organization generate job satisfaction. Bateman and Strasser (1984), Vandenberg and Lance (1992) and Lund (2003) are examples of such studies. The arguments put forward suggest that workers will adjust their job satisfaction levels to correspond with their levels of commitment to the organization. While not the majority view, this perspective is consistent with that taken in psychology that individuals develop attitudes consistent with situations to which they already find themselves committed.[3]

Farkas and Tetric (1989), Lance (1991), and Mathieu (1991) all suggest that the causation between commitment and satisfaction runs in both directions. Mathieu (1991) and Lance (1991) both suggest that the relationship running from satisfaction to commitment is much stronger than the relationship running the other direction. The relative size of the links between commitment and satisfaction reported by Mathieu and Lance is actually very similar to the findings (mentioned earlier) of Lincoln and Kalleberg (1990), though the interpretation is quite different. These authors, like Lincoln and Kalleberg, find significant reciprocal relationships, but unlike Lincoln and Kalleberg these authors do not infer that satisfaction precedes commitment based on the different sizes of the relationships.

A fourth group of studies finds no conclusive evidence of any link between organizational commitment and job satisfaction. These authors include Curry et al (1986),

[2] Allen and Grisaffe (2001) provide an excellent review of the theory and evidence on the connections between commitment and customer reactions.
[3] O'Reilly and Caldwell (1980, 1981) and Staw (1980) discuss this perspective.

Dougherty et al (1985), and Currivan (1999). These authors suggest that there may be no causal relationship between satisfaction and commitment, and that the explanation for the presence of such mixed results in the existing body of work might be explained by the existence of a spurious relationship between commitment and satisfaction.

Put differently: commitment and satisfaction may both be caused by some other determinant(s), thus generating the observed relationships between the two variables. This situation is not unlike the one where we measure the temperature of a glass of water and the diameter of a balloon which are in the same room. There will be a strong correlation between these measures, but not because of a causal linkage between the two. The relationship exists only because both measurements respond to the temperature of the room: as the room gets warmer, the temperature of the water rises, and the air inside the balloon expands. In this way, commitment and satisfaction might both be caused by common determinants which are still poorly understood. This could explain the diversity of findings in the literature.

The variety of empirical results available in the literature indicates that are still some important unanswered questions regarding the connections between commitment and satisfaction. Some mechanism is required to distinguish between competing views of the link between commitment and satisfaction. The next section describes a statistical approach which is helpful in meeting this goal.

2 The bivariate probit approach

Previous work has focused on the determinants of organizational commitment and job satisfaction as if these attitudes are determined independently by employees in response to a range of stimuli, most of which are common to determining both satisfaction and commitment. Most studies model the determination of employee attitudes as independent 'decisions' made in response to individual, workplace, and job characteristics.

One approach to this problem is to investigate the probability that a worker is highly committed to the organization as a function of a range of characteristics, one of which is job satisfaction. Another approach is to investigate the probability that a worker is satisfied with their job as a function of a range of characteristics, one of which is organizational commitment. Instead of using these previously-published approaches, this paper uses a bivariate probit approach to investigate the links between commitment and satisfaction. This approach is distinct from the standard probit approach.

The standard approach to dealing with binary dependent variables is called the *binomial probit model*. Instead of using this common approach, we use the *bivariate probit model* to investigate the data. This approach allows for the possibility that attitudes towards the job and towards the organization are jointly-determined, rather than the result of independent processes. Appendix 1 describes the bivariate probit model in some detail, but focuses on the practical implications of the approach. Interested readers should consult Greene (2003, pg 710-719) for full technical details of the bivariate probit approach.

The key difference between bivariate probit results and those from the more traditional binomial probit model is that, in addition to results associated with each variable of interest for the two decisions, we get an estimate of the interrelatedness (error covariance) of the two decisions under consideration. A significant covariance estimate suggests that the decisions under consideration are interrelated, and that the other coefficient estimates obtained should be regarded as superior to those generated by the use of the traditional binomial approach.

3 Data

The data employed in this paper is taken from structured interviews with 363 employees in 18 UK companies between 2001 and 2003.[4] This data presents a good opportunity to examine the connections between commitment and satisfaction in a fresh environment. Each of these interviews was conducted face-to-face, and took approximately 50 minutes to complete. The wide range of topics covered in these interviews put great pressure on the number of questions devoted to any single subject of interest, but allowed a much more complete understanding of the organizations involved. Companies were selected as subjects because they were known to be using several work practices generally regarded to be high performance work practices. Thus the resulting sample, while not representative, provides an excellent opportunity to understand the links between commitment and satisfaction for employees from a group of firms who are known to use a range of high performance work practices.

The variables used in the estimation of the model are described in turn below. Cronbach's alpha is reported for each variable that is constructed from various closed questions in the survey instrument, and these are all above appropriate threshold values.[5] All constructs have been assembled using confirmatory factor analysis, and in every case they load onto single factors. We begin with description of our two dependent variables, and proceed to describe the independent variables included in subsequent analyses.

3.1 Organizational commitment

Organizational commitment is one of our dependent variables. The definition of organizational commitment is the subject of a great deal of debate. We employ a three item measure of affective commitment which yields an alpha of 0.75. The questions ask

[4] These interviews were conducted with the support of the Chartered Institute of Personnel and Development, and the cooperation of the companies involved. Details are available in Purcell, et al (2003).
[5] Nunaly (1978) suggests 0.7 as an appropriate threshold value for Cronbach's alpha.

respondents to indicate their levels of agreement on a five point scale that offers a neutral midpoint. The three statements respondents reacted to were:

- I feel proud to tell people who I work for.
- I feel loyal to <company name>.
- I share the values of <company name>.

Meyer and Herscovitch (2001) present a recent summary of the literature on commitment, and suggest that, "affective commitment (a) correlates significantly with a wider range of 'outcome' measures and (b) correlates more strongly with any given outcome measure" than does continuance commitment or normative commitment.[6] The importance of affective commitment for a range of outcome measures makes the understanding of its determinants an important task.

For the purposes of bivariate probit analysis we need to code organizational commitment as a binary variable. We set the binary variable equal to one for respondents who express some degree of agreement with all three constituent questions. All other respondents are treated as uncommitted (coded as zero).

3.2 Job satisfaction

Job satisfaction is our other dependent variable. This is measured as a combination of four closed questions yielding a coefficient alpha of 0.70. The questions used in the job satisfaction construct are:

- How satisfied are you with the sense of achievement you get from your work?
- How satisfied are you with the amount of influence you have over your job?
- Overall, how satisfied are you with the influence you have in company decisions that affect your job or work?
- Overall, how satisfied are you with your current career opportunities?

This definition of job satisfaction is quite narrow, but it captures several key non-pay benefits of work. The construct loads onto a single factor, and exhibits appropriate internal reliability.

[6] Meyer and Herscovitch (2001, p. 311).

3.3 Pay satisfaction

Pay satisfaction is measured as a construct of four questions. This alpha associated with this construct is 0.70. The questions ask employees to express their satisfaction on a five point scale. The respondents were also offered the chance to follow up the answers to these questions with an open ended call for them to elaborate on the reasons for their answers. The questions used are:

- How satisfied do you feel with your pay?
- How satisfied do you feel with your pay compared with the pay of other people that work here?
- Overall, how satisfied do you feel with the rewards and recognition you receive for your performance?
- How satisfied do you feel with the benefits you receive other than pay (such as pension, sickness benefit, etc.)?

Our decision to use pay satisfaction as an independent variable is a calculated choice. Pay satisfaction is often regarded as a component of job satisfaction. We do not use pay satisfaction in this way here, as there is good evidence that it represents a separable facet of job satisfaction in this data. Indeed, factor analysis of the combination of the questions used to measure pay satisfaction and the questions used to measure job satisfaction reveals a construct that separates neatly into two distinct factors.[7] Because of this separation between the concepts in this data, and because of the strong policy implications of any results associated with pay satisfaction, we choose to use pay satisfaction as an independent variable in the subsequent analysis.

3.4 Career opportunities

The role of career opportunities in providing incentives in the current job, as well as job satisfaction and commitment are well documented. We asked respondents, "Do you feel there are opportunities for you here for career advancement?" Respondents offering the answer, "Yes" are treated as having career opportunities. Those responding either, "No," or, "Don't

[7] The rotated factor solution is included as Appendix 2 to this paper.

know" are treated as having no career opportunities. The resulting coefficient estimates associated with this dummy variable indicate the effects of definite perceptions of career opportunities on commitment and satisfaction.

3.5 Autonomy

The degree of autonomy on the job is widely regarded as an important determinant of jobs satisfaction and commitment. Here we measure this as the combination of six survey questions. This combination generates an alpha of 0.75. The questions used are:

- Generally, how much influence do you have over how you do your job?
- How often are you asked by managers for your views on future plans for the workplace?
- How often are you asked by managers for your views on staffing issues?
- How often are you asked by managers for your views on changes to work practices?
- How often are you asked by managers for your views on pay issues?
- How often are you asked by managers for your views on health and safety at work?

3.6 Routine

Previous research suggests that employees in highly-routinized jobs are less likely to be satisfied and less likely to be committed to the organization. This variable used in the subsequent analysis is generated from responses to a single question asking for a simple judgment (yes, no, don't know) about the existence of an effort by the firm to make the job "as interesting and varied as possible."

3.7 Support from managers

The support received from managers is an important component of social support in the workplace. Managerial support is measured here by the combination of the responses to eight questions, and the resulting alpha is 0.86. The questions used are:

- Overall, how good do you feel <company name> is at sharing and exchanging knowledge and experience?
- How good do you feel the level of cooperation is with line managers responsible for your work group or work team?

- How good do you feel the level of cooperation is with managers outside your work group or work team?
- How good would you say managers here are at keeping everyone up to date about proposed changes?
- How good would you say managers here are at providing everyone with a chance to comment on proposed changes?
- How good would you say managers here are at responding to suggestions from employees?
- How good would you say managers here are at dealing with problems at the workplace?
- How good would you say managers here are at treating employees fairly?

3.8 Support from co-workers

The support received from co-workers is another important component of social support in the workplace. We measure this support as the response to the question, "How good do you feel the level of cooperation is with employees/colleagues in your work group or work team?" Answers are coded on a five-point scale.

3.9 Workload

The scale of the workload is measured as self-reported 'typical' overtime hours. Some of the firms in the study made extensive use of overtime. For example, 94 percent of all workers interviewed in one high technology manufacturing organization said they worked extra hours in a typical week, and 27 percent of those worked over ten additional hours. Other organizations used extra hours far less frequently and intensely.

3.10 Work-Life balance

Employees were asked to gauge the efforts of the firm to assist them in achieving "a balance between home life and work." Answers were coded on a four point scale, and were followed with an open ended question: "Why do you say that?"

3.11 Role ambiguity

Employees were asked to indicate their level of agreement (again, on a five point scale) with the statement, "I am fully aware of how I contribute to the company achieving its business

objectives." We code this as a dummy variable which takes the value of zero for respondents who express some level of agreement with this statement. All other employees are deemed to be expressing some degree of ambiguity. In the resulting regression sample only 8.5% of respondents are claiming some degree of ambiguity.

3.12 Demographic controls

The model includes a range of demographic controls to account for individual attributes that might otherwise bias the empirical estimates of the links between commitment and job satisfaction. These include controls for age, job tenure, gender, and industry. The importance of such controls is well-established. Beck and Wilson (2001) provide a clear discussion surrounding the value of demographic controls in studies of organizational commitment.

4 Results

Application of the bivariate probit model to the data above yields some interesting results. After the elimination of those observations for which any one of the variables is missing the data comprise responses from 363 employees. We report the results as Table 1.

<<Table 1 about here >>

Results for the equation governing organizational commitment are listed first in the table. The results for job satisfaction are presented to the right of the organizational commitment results. Lastly, the table reports the estimate of the covariance between the error terms of the two equations. We believe that a five percent critical *p*-value is appropriate for these estimations,[8] but we flag significant coefficients at the one percent, five percent and ten percent levels. This allows the reader to make an independent judgment about the significance of each result.[9]

[8] See DeGroot (1984, p. 449-451) for a discussion of choosing appropriate significance levels.
[9] The *p-value* can be thought of as the probability that any particular coefficient estimate is the result of chance.

The significance pattern revealed in Table 1 is quite interesting. The degree of job routinization, role ambiguity, pay satisfaction, and job involvement all appear as significant determinants of organizational commitment. There is weak support for a link between levels of peer support and organizational commitment (p=0.08).

Job satisfaction depends on a somewhat different set of things. Like commitment, satisfaction depends on pay satisfaction, job involvement and perceived levels of job routinization. Additionally, there is evidence linking job satisfaction with career opportunities and the support of managers.

The set of results reported in Table 1 is consistent with most results in the literature. The directions of all significant coefficients are as expected, and the model fit is quite stable in the face of modest changes in the variables used. The model correctly predicts the commitment levels of 70 percent of respondents and the satisfaction levels of 76 percent of respondents. If we 'raise the bar' to consider the fraction of respondents for whom the model correctly predicts *both* satisfaction and commitment the success rate is 59 percent.

There is no evidence in Table 1 linking either satisfaction or commitment with the levels of job autonomy, firm efforts to assist in achieving a work-life balance, or the workload. Currivan (1999) concludes by noting that "a few of the proposed determinants of satisfaction and commitment … may have limited effects on the two employee orientations."[10] Our findings are consistent with this statement, and these 'non-results' are the subject of some discussion in the following section.

The estimates associated with each of the independent variables in the bivariate probit estimation are interesting, but the key statistic for the thesis of this paper is the estimate of the covariance of the error terms from these two equations. The estimate is 0.447, and this is significant at any conventional level. This positive covariance implies that workers who are

[10] See Currivan (1999), pg. 517.

'more committed' than the model predicts are (on average) also 'more satisfied' with their jobs than the model predicts.

On a basic level, the fact that this coefficient is significantly different from zero is an indication that the decision to use a bivariate probit model was warranted. A failure to account for this positive covariance could bias the parameter estimates, and lead to dubious inferences. The nature of these potential mistakes in the existing literature is worthy of some further analysis.

The results reported in Table 1 are bivariate probit results. Table 2 compares these results with coefficient estimates from a traditional binomial probit approach.[11] This allows us to see just how different our estimates of the effects of our independent variables might be if we had not used the correct approach. The significance pattern in the binomial results is the same in the as the pattern observed in the bivariate results presented in Table 1.[12] This means that the significant linkages identified in this data are the same in both cases. The difference between the two approaches is in the coefficient magnitudes. Table 2 summarizes these comparisons for those independent variables in Table 1 that are significant at our chosen significance level of five percent.

<<Table 2 about here>>

The results are revealing. The results for organizational commitment imply that reliance on a traditional binomial probit approach would overstate the effects of job involvement (4.8%), job routinization (8.0%) and role ambiguity (4.9%), while understating the effects of satisfaction with pay (6.7%). The results for job satisfaction display similar errors. The binomial probit results overstate the effects of job involvement (1.1%) and managerial support (6.5%) and understate the effects of job routinization (6.0%), pay satisfaction (4.5%) and career opportunities (6.6%). The significance of the covariance term

[11] Recall, the difference between the binomial probit and the bivariate probit approaches is that the former assumes that the covariance between model errors is zero. The latter makes no such assumption.
[12] In other words, those variables that are significant at the five percent level in the bivariate results presented in Table 1 are still significant at the five percent level in the binomial probit results.

in Table 1 suggests that these differences need to be taken seriously, and we discuss the implications of these results below.

5 Discussion

Table 1 provides evidence that the links between commitment and satisfaction in the data studied here is consistent with the general predictions of the literature, but it also reveals interdependence between these two attitudes. This interdependence, which is indicated by the significance of the estimated covariance term, is consistent with the joint-selection of commitment and satisfaction levels by employees in response to pay satisfaction, job involvement and job routinization. In other words, employee commitment and employee satisfaction with the job are like the glass of water and the balloon used as examples previously, and changes to the HR policies and practices serve the role of the 'temperature of the room' in our running example. This change in temperature generates changes in both commitment and satisfaction. This interdependence creates a correlation between job satisfaction and organizational commitment which could help explain the variety of results published elsewhere. The difficulty in separating the causal direction(s) of the correlation between commitment and satisfaction could be the result of the absence of any such link in practice.

Our results suggest that satisfying levels of pay, high levels of job involvement and low levels of job routinization will enhance both commitment and satisfaction, but they also point to substantial differences in the HR policies and practices that influence commitment and those that affect job satisfaction. Our results suggest that good peer support and clear job expectations enhance employee commitment, but not job satisfaction. Good managerial support and the provision of career opportunities seem to enhance only job satisfaction. This finding is of particular relevance to practitioners because it suggests ways that the HR policy mix can be adjusted to fit company strategy.

Imagine a firm with a strategy built around excellent customer service. In this environment, job satisfaction should be a priority, as happy workers are more likely to satisfy customers.[13] The results of this paper suggest that the provision of desirable career opportunities and good levels of managerial support can support this strategy, even though there appears to be no effect on organizational commitment. Conversely, firms with strategies based on a committed workforce (e.g., strategies where staff retention plays a key role) need to pay particular attention to building collegial relations amongst staff, and providing clear roles for staff. Both the high commitment and high satisfaction strategies would benefit from the provision of satisfying levels of pay, high levels of job involvement and low levels of job routinization.

Of course, many of these determinants of commitment and satisfaction have already been published by other authors, however this paper has demonstrated the interrelatedness of satisfaction and commitment. This means that the results presented elsewhere in the literature may be biased because of the choice of analytical method. Our investigation of this bias suggests that the importance of pay satisfaction may be more important to the determination of commitment and satisfaction in our sample of firms than previously thought. Job routinization may be substantially more important in determining employee commitment than previously thought, while its effects on job satisfaction may have been overstated. This set of results suggests that firms might need to adjust the mix of their HR policies to achieve their desired results.

The insignificance of the results for things like job autonomy, work-life balance, etc., should not be taken as an indictment of the effectiveness of these policies generally, or indeed the effectiveness of these policies in the companies included in this study. The sample of firms used here is not representative of a larger population, and is quite different from the

[13] Brown and Yin (2004) and Yoon, et al (2004) both demonstrate the impact that employees who are satisfied with their jobs can have on customer satisfaction.

'average' firm in the United Kingdom. The insignificance of some of these variables could be the result of a restriction in the range of some of the variables. Put differently, levels of job autonomy (for example) are quite high in this group of firms. This is not surprising, as the companies were selected for the study precisely because of their relatively aggressive approach to HR policy. In such an environment it can be difficult to identify significant variations in commitment or satisfaction attributable to job autonomy because there is not enough meaningful variation in the variable. The significant coefficients we have identified show us that some things that are clearly important, but there are other policies and practices about which we have no conclusive evidence. This situation creates several clear opportunities for further research, which we discuss below.

6 Conclusion

The results presented in this paper are a good illustration of the benefits of the bivariate probit approach for the analysis of employee attitude data. The results also provide support for those authors who suggest that job satisfaction and commitment are not causally related. The evidence presented in this paper is consistent with satisfaction and commitment being the result of a joint-selection process. Failure to account for this connection generates differences in the magnitudes of the significant relationships ranging from 8.0 percent overestimates to 6.7 percent underestimates. Getting the coefficient magnitudes right is important for any practical recommendations for company policy.

The implications of these particular findings are impossible to generalize beyond the firms in this sample because the findings are not based on a dataset that is representative of a larger population. However, they do provide interesting evidence that should be examined more fully with other data. This could be done by application of the bivariate probit model to existing studies based on data in the WERS database, or indeed any large representative

dataset with well-defined measures of organizational commitment, job satisfaction and their determinants.

The non-representative nature of the data used in this study makes the generalization of the estimated coefficients impossible, but the usefulness of the approach faces no such limits. Investigation of other (representative) datasets with the bivariate probit approach holds the promise of substantially improving our understanding of the links between commitment and satisfaction by improving our estimates of the relative importance of the various determinants of job satisfaction and organizational commitment, and better-inform the actions of practitioners. If the results of subsequent investigations confirm the validity of the method then the coefficients estimated will provide meaningful practical guidance to managers about the policies and practices that will have the most effect on job satisfaction and organizational commitment.

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Figure 1

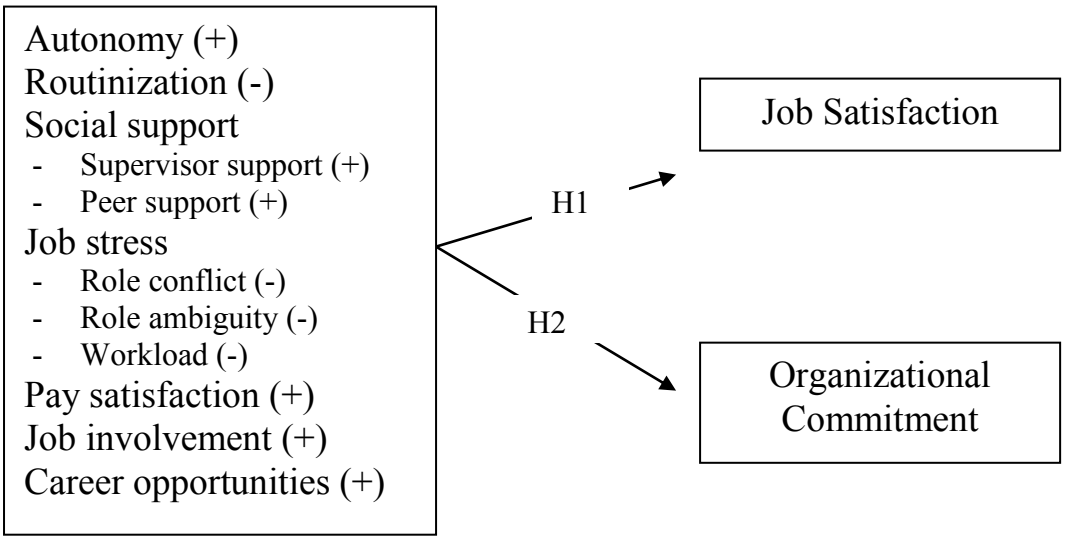
Autonomy (+)
Routinization (-)
Social support
- Supervisor support (+)
- Peer support (+)
Job stress
- Role conflict (-)
- Role ambiguity (-)
- Workload (-)
Pay satisfaction (+)
Job involvement (+)
Career opportunities (+)
H1
H2
Job Satisfaction
Organizational Commitment

Table 1

These are results from maximum likelihood estimation of a bivariate probit model examining the effects of the listed variables on organizational commitment and job satisfaction. The estimation included individual, industrial and occupational control variables not reported here.

	Dependent variables			
	Index equation for organizational commitment		***Index equation for job satisfaction***	
Explanatory variable	*Coefficient*	*T-statistic*	*Coefficient*	*T-statistic*
Constant	0.298	0.591	-0.458	-1.044
Perceived level of job autonomy	-0.006	-0.055	0.044	0.369
Perceived level of job routinization	-0.522	-2.615 ***	-0.388	-2.005 **
Perceived levels of managerial support	0.011	0.108	0.329	2.876 ***
Perceived level of peer support	0.331	1.726 *	-0.013	-0.069
Satisfaction with efforts of firm to facilitate work-life balance	0.294	1.513	0.257	1.255
Role ambiguity	-0.910	-2.260 **	-0.451	-1.484
Extra hours worked in a typical week	-0.003	-0.209	-0.018	-1.131
Satisfaction with pay	0.366	3.238 ***	0.234	2.085 **
Job involvement	1.023	4.671 ***	0.778	3.222 ***
Career opportunities	0.261	1.200	0.554	2.634 ***
Estimated covariance of error terms from index equations	0.447	3.753 ***		

* = significant at the 10% level
** = significant at the 5% level
*** = significant at the 1% level

Table 2

Compares the results from the bivariate probit model reported in Table 1 with results from independent binomial probit models. Comparisons presented only for coefficients significant at the five percent level in Table 1.

	Dependent Variable					
	Organizational Commitment			***Job Satisfaction***		
Explanatory variable	*Bivariate probit coefficient estimate*	*Binomial probit coefficient estimate*	*Percentage change (relative to Table 1)*	*Bivariate probit coefficient estimate*	*Binomial probit coefficient estimate*	*Percentage change (relative to Table 1)*
Perceived level of job routinization	-0.522	-0.480	-8.0%	-0.388	-0.411	6.0%
Perceived levels of managerial support				0.329	0.350	6.5%
Role ambiguity	-0.910	-0.866	-4.9%			
Satisfaction with pay	0.366	0.341	-6.7%	0.234	0.223	-4.5%
Job involvement	1.023	1.072	4.8%	0.778	0.787	1.1%
Career opportunities				0.554	0.517	-6.6%

Appendix 1

In beginning the discussion of the bivariate probit model it is useful to imagine two related decisions by the same individual. One example might be the decision to purchase automobile insurance and the decision to purchase a bus pass. In this case there is an inverse relationship: those who drive to work are likely to purchase automobile insurance, but are unlikely to use public transportation at levels that will induce them to purchase such travel on a volume discount basis. The precise example imagined is not important here, but the idea that we are dealing with two decisions which are jointly-determined is crucial.

Some technical architecture helps to make this structure easier to see. Consider:

$$Y_{1i}^{*} = X_{1i}\beta_1 + u_{1i} \qquad (1)$$
$$Y_{1i} = 1 \text{ if } Y_{1i}^{*} > 0.$$
$$Y_{1i} = 0 \text{ otherwise.}$$

$$Y_{2i}^{*} = X_{2i}\beta_2 + u_{2i} \qquad (2)$$
$$Y_{2i} = 1 \text{ if } Y_{2i}^{*} > 0.$$
$$Y_{2i} = 0 \text{ otherwise.}$$

Those familiar with discrete choice models will recognize the structure of these two equations from the standard set up for probit models. In particular, there is assumed to be some continuous unobservable underlying variable that governs choices (Y^*), but we only observe the actual choices (Y). Thus individuals may be identical in their choice of Y (both choose to ride the bus), but for some of them the choice is more difficult than for others (i.e, they have different values for Y^*).

The standard binomial probit approach presumes that the error terms in (1) and (2) are both distributed along standard normal distributions. This presumption implies that the decisions are unrelated. Another way of saying this is that the error terms u_{1i} and u_{2i} are uncorrelated, or that

$$Cov(u_{1,i}, u_{2i}) = 0. \quad (3)$$

If this were the case then we could simply estimate each of the equations individually to generate valid results. However, if the covariance of the error terms is non-zero the results generated by independently estimated probit equations will be biased.

The bivariate probit model relaxes the assumption of independence that is implicit in the binomial probit model. This allows the researcher to test whether or not the fit of the model is improved through joint analysis of the two decisions under consideration. A parameter of key interest is the estimate of the covariance between the error terms. When this covariance estimate is significantly different from zero it implies the existence of some relationship between the two equations that is not explained by the independent variables: for example, because the decisions are made jointly. If the covariance estimate is equal to zero it is an indication that the bivariate probit approach was not needed. This means that careful interpretation of the results from bivariate probit analysis can yield important insights into the decision process under consideration.

Appendix 2

This is the rotated component matrix for proposed construct combining job satisfaction and pay satisfaction. The rotated solution explains 54.5% of total variance, with 29.5% of this explained by component 1, and the other 25.0% explained by component 2. The eigenvalues for component 1 and component 2 are 3.028 and 1.328, respectively. The two next-highest eigenvalues are 0.886 and 0.725, thus a two-component solution is deemed appropriate.

Rotated Component Matrix[a]

	Component	
	1	2
How satisfied are you with the amount of influence you have over your job?	.760	6.267E-02
How satisfied with sense of achievement from work	.717	3.366E-02
How satisfied are you with the influence you have in company decisions that affect your job or work	.705	.148
How satisfied are you with current career opportunities	.667	.200
How satisfied do you feel with your pay	.123	.843
How satisfied are you with your pay compared with the pay of others	8.757E-02	.801
How satisfied do you feel with the rewards and recognition you receive fo your performance	.544	.580
How satisfied do you feel with the benefits you receive	6.450E-02	.492

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.